ERDC MSRC/PET TR/00-05

1999 ERDC PET Training Activities

by

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Work funded by the DoD High Performance Computing Modernization Program CEWES Major Shared Resource Center through

Programming Environment andTraining (PET)

Supported by Contract Number: DAHC94-96-C0002
Nichols Research Corporation

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Wayne Mastin*

December 28, 1999

1 Introduction

This report summarizes the training activities conducted through the PET program at the ERDC MSRC for the 1999 calendar year. These activities were organized by the PET on-site staff in collaboration with Syracuse University, PET lead university for training, and the members of the PET university team providing training classes to the ERDC MSRC user community. Similar reports were produced for the years of 1997 and 1998, [1] and [2].

The PET training program has been somewhat restructured during 1999. The total number of training classes was reduced to 18 from the 24 that were held during 1998. This reduction was attributed mainly to the discontinuation of basic parallel programming courses on topics such as MPI and HPF. In contrast to the situation at the beginning of the PET program, the ERDC MSRC user community as a whole is now well-versed in basic knowledge of parallel programming. The demand has now shifted to more targeted courses that address specific computational technology areas or software systems. One thing that has not changed is the need for machine-specific training on the HPC platforms housed at the ERDC MSRC. This year there were training classes on all three platforms, the SGI Origin2000, the Cray T3E, and the IBM Power3 SMP. These training classes are a quick and cost effective means of getting new users up and running at the ERDC MSRC.

A significant effort of the PET program continues to be directed toward the application of TANGO Interactive for distance training and education. While TANGO is not yet routinely used as a training tool, it is also no longer purely experimental. Over the last two years, four training classes have been broadcast from the ERDC MSRC to remote users, one seminar was delivered to ERDC MSRC users, and three semester length college courses were delivered by PET university partners to other universities and the ERDC MSRC, all using TANGO. Recent activities with TANGO are documented in two PET Technical Reports, [3] and [4].

The PET training team supports not only training activities, but also provides logistical and technical support to all areas of the PET program.

2 Training Classes

PET training is designed to assist the DoD scientists and engineers in efficiently using the present and future SPP (Scalable Parallel Processing) hardware acquired under the HPCM program. The training curriculum is a living document with new topics being added continually to keep up with the fast pace of research and development in the field of HPC. The curriculum contains courses in the following general categories.

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- Parallel programming
- Architecture and software specific topics
- Visualization and performance
- CTA targeted classes, workshops, and forums

Table 1 gives a list of all classes taught during 1999 with the number of students attending each class. Unless otherwise noted, the classes were held in the ERDC MSRC Training and Education Facility (TEF). From this table, we have the following totals.

- Number of classes: 18
- Number of classes delivered to remote sites: 4
- Number of students: 203

Date	Class	No. of Students
Jan. 7-8	Techniques in Code Parallelization	10
Jan. 26-27	Parallel Programming on the Origin2000 [1]	24
Jan. 28	SciVis Demo - CUMULVS	6
Jan. 29	SciVis Demo - ISTV	5
Mar. 9	WebFlow	14
May 11-12	Using the Cray T3E [1]	8
May 26-27	Marine Forecasting Models	8
July 6-9	Mechanical Analysis using DADS	11
July 6-9	Designing and Building Parallel Programs [2]	8
July 20-21	EnSight and EnSight Gold	12
July 27-28	Pthreads	9
Aug. 10-11	HLA Special Training Event	15
Aug. 17-18	Distance Education Workshop [3]	29
Sep. 8-9	Linear Algebra Libraries	5
Sep. 17-18	Distance Training Workshop	10
Sep. 28-29	Parallel Algorithms	10
Nov. 9-10	Advanced EnSight	7
Dec. 7-8	IBM Power3 SMP Parallelization Workshop	12

[1]TANGO broadcast to remote sites
[2]Taught at BBN, New London, CT
[2]Taught at Jackson State University

Table 1: Classes taught from January through December 1999

This year only one class was held at a remote user site. However, two training classes were broadcast to remote sites using TANGO, and there continued to be significant attendance of off-site users at on-site training classes. The Distance Education Workshop, taught by Syracuse University at Jackson State University, attracted users from both ERDC and ARL. The PET university team was the primary provider of training classes. The HLA, DADS, EnSight, and IBM SP training classes were supplied by vendors. Two classes, Designing and Building Parallel Programs and Pthreads, were delivered by the on-site PET staff.

Training material is available for most classes and selected classes are recorded on VHS tapes. Information on availability of material and tapes may be obtained from ERDC MSRC HPC User Support by email at info-hpc@wes.hpc.mil or phone at 601-634-4400 (option 1) or 1-800-500-HPCC. Descriptions for all training classes offered in 1999 appear in Appendix A.

3 Conference Tutorials

The PET team was also active in teaching tutorials at professional meetings. These events were sponsored by the conference organizer and disseminated knowledge not only to the ERDC MSRC users, but also to the larger HPC user community. Syracuse University offered a tutorials on TANGO and Java at the DoD HPC Users Group Conference in Monterey, CA, on June 7, 1999. Dr. Clay Breshears and Dr. Henry Gabb of the PET on-site team taught a Pthreads tutorial at SC99 in Portland, OR, on November 14, 1999.

4 Seminars

The PET program offers seminars on an irregular basis. These are presentations by experts in their field and are designed to introduce the ERDC MSRC users to current research topics in HPC. A list of seminar presentations for 1999 appears in Appendix B.

5 HBCU/MI Efforts

Jackson State University and Syracuse University completed their second full year of offering distance education classes over the web using TANGO Interactive. A milestone was reached in the Spring of 1999 when Jackson State University delivered the "Programming for the WEB" course to Morgan State University. This was the first time a university other than Syracuse University delivered a semester-length course using TANGO. Syracuse University also delivered two graduate computer science courses to Jackson State University. The success of Syracuse University and Jackson State University in distance education has lead to plans for the first TANGO-based graduate course to be offered through the ERDC Graduate Institute during the spring semester of 2000.

Course descriptions of all distance education classes are included in Appendix C. Course numbers are those assigned by the university teaching the course and may be different when offered by other universities.

6 Conclusions

Although it may seem paradoxical, one constant in the PET training program is change. While the architecture of HPC systems has changed little over the last few years, and little change is expected in the immediate future, the field of information technology continues to evolve at a rapid rate. The growing presence of the web will effect how ERDC MSRC users compute in the future. The location of data, programs, and host machine will be less important, while information management will become a greater problem. One of the goals in the PET program will be to provide the training that users need to compute in future distributed environments. The HPC resources may not change, but the user may access these resources using practically any device with an internet connection, from a high-end workstation down to a PDA. Thus the PET program will continue to evolve as it has done from the beginning. Evidence of this evolution may be seen by comparing the training activities in this report with those of the reports of 1997 and 1998 activities, [1] and [2].

The scheduling of training classes and other events is coordinated with the MSRCs at ARL, ASC, and NAVO. The current schedule of ERDC MSRC training classes is on the web at `http://www.wes.hpc.mil/msrc/training/f_cewes.html`. Suggestions for future training are always welcome and can be made by contacting Dr. Wayne Mastin by email at mastin@wes.hpc.mil or by phone at 601-634-3063. The PET training staff is also available to provide facilities and technical support for ERDC MSRC user sponsored training events, meetings, and workshops.

References

[1] Wayne Mastin, "1997 CEWES MSRC PET Training Activities," CEWES MSRC PET TR 98-01, Vicksburg, MS, 1998.

[2] Wayne Mastin, "1998 CEWES MSRC PET Training Activities," CEWES MSRC PET TR 99-08, Vicksburg, MS, 1999.

[3] Troy Baer, David Ennis, James Giuliani, Leslie Southern and David E. Bernholdt, "Experiences with Using TANGO Interactive in a Distributed Workshop," CEWES MSRC PET TR 99-21, Vicksburg, MS, 1999.

[4] Geoffrey C. Fox, Roman Markowski, Nancy J. McCracken, Marek Podgorney, Qutaibah Malluhi and Debasis Mitra, "More Experiences with TANGO Interactive in Synchronous Distance Learning Courses," CEWES MSRC PET TR 99-32, Vicksburg, MS, 1999.

A Training Classes

CODE PARALLELIZATION

TITLE: Techniques in Code Parallelization

INSTRUCTORS: Mary Wheeler, Clint Dawson and Victor Parr, University of Texas at Austin

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00 - 16:00, Thursday, January 7 - Friday, January 8, 1999

INSTRUCTION MODE: Lecture and discussion

TARGET AUDIENCE: Users and developers of parallel codes for MPP systems

PREREQUISITES: Basic knowledge of numerical methods and parallel processing

OVERVIEW: The techniques needed to parallelize an algorithm and code are described. These include discretization methods, domain decomposition, linear and nonlinear solver issues, mesh partitioning, load balancing, preprocessing, and postprocessing. Examples of parallelization efforts carried out at the University of Texas at Austin will be given. Participants will also have a chance to bring their "dusty deck" codes for discussion on how best to migrate them to parallel platforms.

SGI ORIGIN2000 PROGRAMMING

TITLE: Parallel Programming on the SGI Origin2000 using OpenMP

INSTRUCTOR: David Ennis, Ohio Supercomputer Center

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00-16:30, Tuesday, January 26 - Wednesday, January 27, 1999

INSTRUCTION MODE: Lecture and hands-on laboratory. The class was also available at the ARL, ASC, and NAVO MSRCs and at NRL using TANGO Interactive.

PREREQUISITES: Users should be familiar with high-level programming languages (Fortran, C).

OVERVIEW: This "how-to" workshop is designed to train the participants in the techniques and tools required to perform parallel programming using OpenMP directives on the SGI Origin2000 (O2K). After a discussion of the MIPS R10000 processor, the O2K architecture, and an introduction to IRIX creation and scheduling of parallel threads, the OpenMP directives will be discussed in detail along with examples of their use. The course will conclude with the equally important topic of how to distribute the data used by parallelized OpenMP regions among the local memories on the O2K.

SCIENTIFIC VISUALIZATION SOFTWARE DEMO - CUMULVS

TITLE: Computational Monitoring Using CUMULVS

INSTRUCTORS: Dave Semeraro and Alan Shih, NCSA, University of Illinois at Urbana-Champaign

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00-16:30, Thursday, January 28, 1999

INSTRUCTION MODE: Lecture and laboratory

TARGET AUDIENCE: Scientists and engineers who desire to monitor the progress of simulation codes during execution. Computational monitoring may be used to view the progress of a simulation or to stop the execution of a program generating erroneous results.

PREREQUISITES: Users should be familiar with high-level programming languages (FORTRAN, C).

OVERVIEW: Computational monitoring lets you visualize simulation output while your computation executes. This can be useful for users with codes that produce very large output files, or when you want to stop a run that is not progressing satisfactorily. This "how-to" workshop will educate participants in the techniques and procedures required to perform interactive computation using currently available tools. The workshop will include:

1. An overview and discussion of available tools, commercial or freeware
2. An introduction to CUMULVS from Oak Ridge National Lab
3. Detailed steps for how to instrument your code to use CUMULVS
4. Discussion of possibilities for computational monitoring for participants' codes

Information on CUMULVS along with sample applications can be found at http://www.epm.ornl.gov/cs/cumulvs.html.

SCIENTIFIC VISUALIZATION SOFTWARE DEMO - ISTV

TITLE: Interactive Structured Time-varying Visualizer (ISTV)

INSTRUCTORS: Michael Chupa and Robert Moorhead, ERC, Mississippi State University

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00-16:00, Friday, January 29, 1999

INSTRUCTION MODE: Lecture and hands-on laboratory

TARGET AUDIENCE: Scientists and visualization practitioners whose codes deal with time-varying multiblock or multigrid simulations. While this package was written with the needs of high-resolution ocean modelers in mind, the techniques and the codes are suited to a much wider range of problems, including CFD and CSM.

PREREQUISITES: Basic familiarity with the Unix operating system and scientific visualization tasks

OVERVIEW: This tutorial introduces the Interactive Structured Time-varying Visualizer (ISTV), an OpenGL-based scientific visualization package available on IRIX and Solaris. ISTV is an interactive visualization system that visualizes time-varying multiblock (or multigrid) simulations on time-varying grids. ISTV's genesis was in the need for a toolkit to visualize data from high-resolution ocean models. By exploiting modularity and plug-ins, the scientist has the ability to tailor the ISTV visualization system to the needs of a particular discipline or problem without having to write a completely new system.

WEBFLOW

TITLE: WebFlow: Web Interfaces for Computational Modules

INSTRUCTOR: Tomasz Haupt, NPAC, Syracuse University

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00-16:00, Tuesday, March 9, 1999

INSTRUCTION MODE: Lecture and hands-on laboratory

PREREQUISITES: Basic knowledge of object oriented programming (in particular Java). Knowledge of distributed object technologies such as CORBA or Java RMI are helpful but not necessary.

OVERVIEW: In this class we will present the WebFlow system developed at Northeast Parallel Architectures Center (NPAC) at Syracuse University. This system addresses the needs for high level programming environments and tools to support distance computing on heterogeneous, distributed platforms. More specifically, WebFlow is a scalable, high level, commodity standards based HPDC system that integrates:

High-level front-ends for visual programming, steering, run-time data analysis and visualization, built on top of the Web and OO commodity standards (Tier 1)

Distributed object-based, scalable, and reusable Web server and object broker middleware (Tier 2)

High performance backend (Tier 3)

The WebFlow approach to high-performance distributed computing is designed to make it easier for application developers to work with distributed HPC resources, couple distinct application codes together to create more sophisticated and complex simulations, and facilitates the development of interfaces to large simulation codes which can be used from any network-connected computer. During the class we will describe and demonstrate the WebFlow system. This will include background information on CORBA and developing CORBA objects in Java. We will present the architecture of WebFlow, discuss its security model, and methods of providing seamless access to remote resources. The class will be focused on applying WebFlow to the users' applications. We will explain how to customize the WebFlow front-end to the needs of a particular application, and how to invoke and control the users' computational modules.

CRAY T3E

TITLE: Using the Cray T3E

INSTRUCTOR: Troy Baer, Ohio Supercomputer Center

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00-16:30, Tuesday, May 11 - Wednesday, May 12, 1999

INSTRUCTION MODE: Lecture and hands-on laboratory. The course was also available at AFRL-Kirtland using TANGO Interactive.

PREREQUISITES: Users should be familiar with high-level programming language (Fortran, C). Experience with a message passing library (MPI, PVM, or Cray SHMEM) is helpful, but not necessary.

OVERVIEW: This "how-to" workshop is designed to train the participants in the techniques and tools required to perform parallel programming on the Cray T3E. Topics include a discussion of the EV5 Alpha processor, the T3E architecture, the UNICOS/mk operating system and environment, program development tools, software libraries, single processor optimization techniques, and message passing library considerations.

MARINE FORECASTING MODELS

TITLE: Parallelization, Optimization, and Coupling of Marine Circulation, Sediment Transport, and Wind-Wave Models

INSTRUCTOR: Keith Bedford, Ponnuswamy Sadayappan, and David Welsh, The Ohio State University

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00-16:00, Wednesday, May 26 - Thursday, May 27, 1999

INSTRUCTION MODE: Lecture and hands-on laboratory

TARGET AUDIENCE: Scientists who are considering, or actively pursuing, migration of their sequential codes to parallel platforms

PREREQUISITES: Basic familiarity with FORTRAN programming and numerical simulation of physical processes

OVERVIEW: The aims of this class are to discuss the migration of numerical codes from sequential to parallel computing platforms, and the coupling of parallel codes. Parallelization and optimization strategies will be addressed as well as their effects on scalability. The CH3D-SED marine circulation and sediment transport model and the WAM wind-wave model will be used as examples. The class will include a significant hands-on laboratory component, with exercises intended to demonstrate the impact of algorithm design/implementation choices on achieved performance on modern parallel supercomputers. The class will neither assume prior familiarity with MPI or OpenMP, nor go into great detail concerning them. After taking this class, it is hoped that attendees unfamiliar with parallel programming will be motivated to take PET classes on MPI and/or OpenMP.

MECHANISM ANALYSIS USING DADS

TITLE: Mechanism Analysis Using DADS: Introductory Class

INSTRUCTOR: Dave Venem, Senior Applications Engineer, LMS CADSI

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 13:00-16:00, Tuesday, July 6,1999
09:00-16:00, Wednesday, July 7,1999
09:00-16:00, Thursday, July 8,1999
09:00-12:00, Friday, July 9, 1999

INSTRUCTION MODE: Lecture and hands-on laboratory

TARGET AUDIENCE: DADS is an intensive course designed to introduce software capabilities to engineers and technical managers allowing them to develop the expertise to effectively use the program.

PREREQUISITES: No previous experience is required, with DADS or any other mechanical system modeling software, for participants to attend. However, the course structure assumes that students have had some experience using computers, as well as a basic knowledge of mechanical engineering.

OVERVIEW: The goal of this class is to present an overview of the DADS software using a combination of lecture and hands-on lab exercises. A basic vehicle will be created to include bodies (components), joints (connecting the bodies together), and forces (tires, springs, etc.). Various types of analysis will be discussed including kinematic, inverse dynamic, static, and dynamic. There will also be a brief introduction into the use of the DADS control elements followed by a lab to define a speed controller for the vehicle. In addition, new features will be shown including interactive analysis: the ability to turn elements on and off at any point during an analysis.

ENSIGHT TRAINING

TITLE: EnSight: A General-purpose Package for Scientific Visualization

INSTRUCTORS: Dave Baumgarten and Mel Spencer, Computational Engineering International, Inc.

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00 - 17:00, Tuesday, July 20 - Wednesday, July 21, 1999

INSTRUCTION MODE: Lecture and hands-on laboratory

TARGET AUDIENCE: Scientists needing visualization of simulations, animations, virtual reality

PREREQUISITES: For new users of EnSight, a review of the EnSight tutorial manual "Getting Started" is recommended, but not required.

OVERVIEW: EnSight is a general-purpose visualization package widely used by engineers and scientists in the defense and aerospace industries to postprocess results from CFD, combustion, FEM and CEM analyses. EnSight Gold is an advanced version of EnSight for very large problems and virtual reality applications. This training course will cover essentially all features of EnSight in a busy 2-day course consisting of four sessions. Also planned is a hands-on demonstration of EnSight Gold running on the ImmersaDesk VR system at ERDC MSRC.

PTHREADS

TITLE: Multi-threaded and Concurrent Programming with POSIX Threads

INSTRUCTORS: Clay Breshears, CRPC, Rice University
Henry Gabb, Nichols Research, ERDC MSRC

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00 - 17:00, Tuesday, July 27 - Wednesday, July 28, 1999

INSTRUCTION MODE: Morning: Lectures, Afternoon: Hands-on workshop sessions

TARGET AUDIENCE: Developers of parallel scientific applications or anyone converting serial codes for parallel execution

PREREQUISITES: Basic knowledge of parallel processing. Programming experience or familiarity with the C language will be helpful. Though most examples given will be in C, students should be able to easily follow and understand them.

OVERVIEW: Pthreads is a POSIX standard library for multithreading. Tasks are assigned to threads that execute concurrently. On symmetric multiprocessors, threaded tasks can execute in parallel. The Pthreads library consists of 61 functions governing thread creation and management, mutual exclusion, conditional variables and thread signalling, and low-level scheduling.

The tutorial begins with a discussion of concurrency. Classic concurrent programming models (e.g., boss-worker, producer-consumer) and problems (e.g., The Dining Philosophers) illustrate the use of threads to express concurrent tasks. The pitfalls of race conditions and deadlock are introduced. After laying a foundation in concurrency, the tutorial covers the 14 core Pthreads functions most useful to scientific programming. Each function is discussed in detail with example codes to illustrate usage. A detailed discussion of mutual exclusion variables shows how to avoid common race conditions like write/write and read/write conflicts. Lastly, conditional variables and thread signalling are discussed. Finally, a series of examples will be presented to demonstrate the utility of Pthreads in scientific programming. These include algorithms from the C3I Benchmark (terrain masking, route optimization, image correlation) as well as matrix multiplication and LU decomposition.

HLA SPECIAL TRAINING EVENT

TITLE: CEWES Special Training Event on High Level Architecture (HLA)

SPONSOR: Defense Modeling and Simulation Office (DMSO)

LOCATION: ERDC MSRC, Building 8000, Room 1205 (Collaboratorium)

TIME: 08:10 - 16:00, Tuesday, August 10, 1999
08:00 - 15:00, Wednesday, August 11, 1999

OVERVIEW: This event provides a comprehensive introduction to HLA. Topics include an overview of the HLA goals, policy, and the development process; a full description of the HLA Specifications; detailed coverage of technical topics like Time Management and the Run-Time Infrastructure (RTI); supporting processes like the object model development process, supporting tools and the compliance testing process; and testimonials of actual usage by different implementing organizations.

DISTANCE EDUCATION WORKSHOP

TITLE: Distance Education Workshop

INSTRUCTORS: Nancy McCracken and Marek Podgorny, NPAC, Syracuse University

LOCATION: Room 117c, John A. Peoples Building, Jackson State University, Jackson, MS

TIME: 09:00 - 17:00, Tuesday, August 17, 1999
09:00 - 12:00, Wednesday, August 18, 1999

INSTRUCTION MODE: Mixture of lecture and hands-on sessions

TARGET AUDIENCE: Educators interested in extending their educational activities through the use of modern distance learning tools. The class also includes an introduction to the TANGO Interactive collaboration tool that would also be useful for those with a particular interest in participating in training classes delivered via TANGO.

PREREQUISITES: none

OVERVIEW: The advent of the Internet and the more recent development of the World Wide Web, Java, and other related technologies has revolutionized the prospects for distance education. Whereas previously, interactive presentation of a course to a remote classroom required the use of expensive, specialized equipment and communications facilities, it is now possible using commodity desktop computers over the Internet. For the past several years, a PET-supported collaboration between Syracuse and Jackson State Universities has enabled Syracuse faculty members to teach four regular, semester-long academic credit classes to JSU students, introducing new material to which JSU students would not have otherwise had easy access. JSU faculty have recently used some of this course material to deliver a course to Morgan State University in the same fashion. Attendees of this Workshop will be introduced to the TANGO Interactive network-based collaboration system, which has been used in the SU-JSU classes. Authoring and presentation of educational material in the distance environment will be discussed, as will some of the special considerations that come with teaching to remote students. Other tools for "network-based" distance education will also be discussed. Hands-on sessions will emphasize the general use of the TANGO Interactive system and development and delivery of educational material through this tool.

PARALLEL LIBRARIES

TITLE: How to use Parallel Linear Algebra Library Routines

INSTRUCTORS: David Ennis, Ohio Supercomputer Center

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00 - 17:00, Wednesday, September 8 - Thursday, September 9, 1999

INSTRUCTION MODE: Lecture and hands-on laboratory.

TARGET AUDIENCE: Novice to experienced programmers interested in how to use parallel libraries

PREREQUISITES: Basic knowledge of parallel processing would be useful, but is not required.

OVERVIEW: Remember when a user would sit down at a main-frame computer or vector supercomputer and know that there would be an extensive library of linear algebra routines available for their use? Since the advent of parallel supercomputers, users have asked for the same thing: Isn't there a library routine I can call that will perform my matrix-matrix multiplication in parallel for me? The answer to this question and others like it is finally yes, and such parallel linear algebra libraries will be the subject of this course.

Specifically, this advanced course will focus on the libraries which have become the "de facto" standards for parallel linear algebra: SCALAPACK (the parallel successor to LAPACK) and PBLAS (the parallel successor to BLAS). Both of the libraries build upon calls to the BLACS library which will set up the processors in a communication grid that matches the problem being solved and distributes appropriate array elements to the correct processor's memory to achieve good performance.

Since the entire procedure of using BLACS to establish the correct processor environment, and then preparing for and calling the desired PBLAS or SCALAPACK routine can be a bit intimidating to new users the course will show numerous examples. The examples will cover "popular" linear algebra tasks such as matrix-vector multiplication, matrix-matrix multiplication and solving a set of simultaneous linear equations (ALL IN PARALLEL).

DISTANCE TRAINING

TITLE: Distance Training Workshop

INSTRUCTOR: Geoffrey C. Fox, NPAC, Syracuse University

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

TIME: 09:00 - 17:00, Thursday, September 16, 1999
09:00 - 12:00, Friday, September 17, 1999

INSTRUCTION MODE: Mixture of lecture and hands-on sessions

TARGET AUDIENCE: This class is designed for those interested in developing and delivering training to remote sites via the TANGO Interactive system. The class includes an introduction to the TANGO Interactive collaboration tool that would also be useful for those with a particular interest in participating in training and classes delivered via TANGO and in using TANGO for general collaboration.

PREREQUISITES: None

OVERVIEW: The advent of the Internet and the more recent development of the World Wide Web, Java, and other related technologies has revolutionized the prospects for distance education. Whereas previously, interactive presentation of a course to a remote classroom required the use of expensive, specialized equipment and communications facilities, it is now possible using commodity desktop computers over the Internet.

For the past several years, a PET-supported collaboration between Syracuse and Jackson State Universities has enabled Syracuse faculty members to teach four regular, semester-long academic credit classes to JSU students. More recently this technology has been transitioned into the PET training environment through a number of training classes and seminars delivered with TANGO Interactive which have reached more than 100 users at 7 different sites.

Attendees of this Workshop will be introduced to the TANGO Interactive network-based collaboration system, which has been used in the distance training and seminars. Authoring and

presentation of course material in the distance environment will be discussed, as will some of the special considerations that come with teaching to remote students. Other tools for "network-based" training will also be discussed. Hands-on sessions will emphasize the general use of the TANGO Interactive system and development and delivery of training course material through this tool.

PARALLEL ALGORITHMS

TITLE: Workshop on Parallel Algorithms

INSTRUCTORS: C. T. Kelley, North Carolina State University, Phu V. Luong, ERDC MSRC, Clint Dawson and Mary F. Wheeler, Center for Subsurface Modeling, University of Texas at Austin

TIME: 08:45 - 16:30, Tuesday, September 28, 1999
09:00 - 14:00, Wednesday, September 29, 1999

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

INSTRUCTION MODE: Lecture

TARGET AUDIENCE: Users and developers of parallel codes

PREREQUISITES: Basic knowledge of numerical methods and parallel processing

OVERVIEW: The techniques needed to parallelize an algorithm and code are described. These include discretization methods, domain decomposition, linear and nonlinear solver issues, mesh partitioning, load balancing, preprocessing, and postprocessing. Examples of parallelization efforts carried out at the University of Texas at Austin will be given.

ENSIGHT ADVANCED TRAINING

TITLE: Advanced Training for EnSight: a General-purpose Package for Scientific Visualization

INSTRUCTORS: Bruce Nay and Mel Spencer, Computational Engineering International, Inc.

TIME: 09:00 - 17:00, Tuesday, November 9 - Wednesday, November 10, 1999

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

INSTRUCTION MODE: Lecture and hands-on laboratory

TARGET AUDIENCE: Scientists needing visualization of simulations, animations, virtual reality

PREREQUISITES: The instructors will assume that the attendees have basic EnSight skills.

OVERVIEW: EnSight is a general-purpose visualization package widely used by engineers and scientists in the defense and aerospace industries to postprocess results from CFD, combustion, FEM, and CEM analysis. EnSight Gold is an advanced version of EnSight for very large problems and virtual reality applications.

This training course will concentrate on some of the more advanced features of EnSight. The agenda is "loose" and will be driven somewhat by class input.

IBM POWER3 SMP PARALLELIZATION WORKSHOP

TITLE: IBM Power3 SMP Parallelization Workshop

INSTRUCTOR: Eric S. Myra, Applications Specialist, Scientific/Research Computing, IBM Corp.

TIME: 09:00 - 17:00, Tuesday, December 7 - Wednesday, December 8, 1999

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

INSTRUCTION MODE: Lecture and hands-on laboratory

TARGET AUDIENCE: ERDC MSRC applications developers and users

PREREQUISITES: Parallel programming experience

OVERVIEW: The ERDC MSRC will shortly install a major upgrade to its IBM SP. This new system will consist of "Nighthawk-1" nodes that IBM has recently introduced, based on the Power3 microprocessor technology. These new eight-processor SMP nodes present new opportunities and challenges for achieving high-performance in a multi-node SMP environment. In order to help applications developers, the ERDC MSRC and IBM are sponsoring a two-day workshop at the ERDC to introduce the new nodes and the programming models that best exploit their performance potential. Planned topics include:

1. Architectural overview of the SP, including technology directions
2. SP programming/usage models
3. Mixed-mode programming (message passing and threads)
4. Porting issues in moving codes from the currently installed SP
5. Optimizing applications by use of compiler options, tuning, and optimized libraries
6. Architectural overview of GPFS with hints for tuning I/O performance.

In addition, the class will include some hands-on time on ERDC MSRC's Nighthawk system to allow attendees to try out the new features and techniques.

B Seminars

DOCUMENT OBJECT MODELS

TITLE: All you wanted to know about Document Object Models: From JavaScript to CORBA and JINI

SPEAKER: Geoffrey Fox, Syracuse University

TIME: 09:00-10:00, April 6, 1999

ABSTRACT: We use documents to illustrate modern distributed object technology and discuss them at all levels of granularity from individual text and image components through pages, sessions and Web Sites. We show how XML, events, RMI, CORBA, JINI and JavaSpaces fit in. We describe the implications of current W3C document object model for collaboration (as in TANGO Interactive) and universal access.

This seminar was broadcast over the web from Syracuse to all four MSRCs using TANGO

FREE-SURFACE COMPUTATIONS

SEMINAR: Parallel Finite Element Computations of Unsteady Free-Surface Flow Problems with Large Deformations

SPEAKER: Shahrouz K. Aliabadi, Department of Engineering, Clark Atlanta University

TIME: 13:00-14:00, October 5, 1999

LOCATION: ERDC MSRC, Building 8000, P. K. Senter Conference Room

ABSTRACT:

Numerical simulation of free-surface flow problems can be carried out using either surface-tracking or surface-capturing methods. In the surface-tracking method, the location of the free-surface is updated by moving the computational mesh. Generally, the surface-tracking methods provide an accurate representation of the free-surface. However, there are certain difficulties and limitations involved in moving the computational mesh. In 3D computations, especially when the free-surface is subjected to a large displacement, the surface-tracking methods may require frequent re-meshing, which will become time consuming and impractical. In such cases, the surface-capturing methods using fixed computational meshes can be used. In surface-capturing techniques, the Navier-Stokes equations are solved over a non-moving mesh. A color function with two distinct values serves as a marker identifying the free-surface. Compared to the surface-tracking methods, the surface-capturing methods are much more flexible and cost effective, but the accuracy of the method extensively depends on the mesh resolution. More mesh refinement results in the better solution.

In this presentation, we will present an accurate surface-capturing method with built in front-sharpening and mass conservation algorithms. In this method, we accurately represent and advect the color function in such a way that mass conservation for each fluid is satisfied. Many 3D free-surface flow applications with moving boundaries will be presented.

CO-ARRAY FORTRAN

TITLE: Co-array Fortran

SPEAKER: Robert W. Numrich, Principal Scientist, Cray Research

TIME: 09:00-12:00, October 13, 1999

LOCATION: ERDC MSRC, Building 8000, Room 1055 (TEF)

ABSTRACT: Co-array Fortran is a parallel extension to Fortran 90/95 that defines a simple array syntax to perform data decomposition. For some applications, it can simplify parallel programming. Co-array Fortran is currently available on the ERDC MSRC CRAY T3E. Please see the co-array Fortran web site (www.co-array.org) for additional information.

The first part of this seminar will consist of a lecture on co-array Fortran syntax, followed by coding examples. Afterwards, Dr. Numrich will be available for individual consultation.

C Distance Education Courses

CSC 499 Programming for the WEB

INSTRUCTOR: Qutaibah Malluhi, Jackson State University

DATE: Spring Semester, 1999

METHOD OF DELIVERY: TANGO from Jackson State University to Morgan State University

PREREQUISITES: An introductory course in computer programming

TARGET AUDIENCE: Upper level undergraduate students in computer science

DESCRIPTION: This programming course covers basic programming languages and skills to provide a basis for the further study of Web software applications. Students learn Web architecture and Web interfacing mechanisms through the Common Gateway Interface (CGI). The main part of the course concentrates on the use of the Java programming language for Web user interfaces and for distributed computing.

CPS 616 Computational Science for Information Applications

INSTRUCTORS: Geoffrey Fox and Nancy McCracken, Syracuse University
Debasis Mitra, Jackson State University

DATE: Spring Semester, 1999

METHOD OF DELIVERY: TANGO from Syracuse to JSU

PREREQUISITES: Knowledge of Java Programming is required, knowledge of Unix for assignments is helpful

TARGET AUDIENCE: Graduate computer science students

DESCRIPTION: This course surveys several software technologies of current interest for use with integrated systems in collaboration, databases, and distributed computing. Specific topics in the course evolve rapidly to include leading edge technologies. Currently included are Web interfaces to relational databases using JDBC, JavaScript and advanced HTML such as DHTML (Dynamic HTML) for rapid development of user interfaces, the use of CORBA to connect distributed applications, component programming with JavaBeans, and security and commerce software.

CPS 640 Topics in Networking and Multimedia Applications

INSTRUCTORS: Roman Markowski and Marek Podgorny, Syracuse University

DATE: Fall Semester, 1999

METHOD OF DELIVERY: TANGO from Syracuse to Jackson State, Morgan State, Clark Atlanta, and Mississippi State Universities

PREREQUISITES: CPS 606 or CPS 616 or permission of instructor

TARGET AUDIENCE: Graduate computer science students

DESCRIPTION: The primary objective of the course is to provide a comprehensive panorama of networked multimedia applications and the underlying computer and networking technology. We will discuss how existing and emerging data communication technologies can meet multimedia application requirements. The course covers LAN and WAN Technologies, Bridging, Switching, Routing, Networking Protocols, Management, Design and Security as well as Multicast, Videoconferencing, Multimedia Collaboration Technologies and Audio/Video compression and coding.

The course material is designed as an introduction to the field and a practical guide for designing and planning networks for multimedia applications. Note that the word "topics" in the title means that the course content will vary to reflect current or interesting topics in the field.

The course material is divided into 12 main modules and the structure reflects the following sequence of questions:

- what is the current and future networking infrastructure
- what are existing and future multimedia applications
- what requirements does multimedia place on the underlying networks
- what solutions are available to satisfy the requirements